National Park Service
U.S. Department of the Interior
Alaska Inventory and Monitoring Program
240 West 5th Ave
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907-644-3695 phone
www.nps.gov/akso/nature/environment/glaciers

Date: February 8, 2012

Topic: Meet the Experts: Glaciers, Script of Q and A session

Q: What causes glaciers to surge?
A: Glaciers that surge have beds with loose material. these glaciers don't sit on hard bedrock, they are more likely on fault lines and ground up bedrock. still mysterious and somewhat random but water builds up in sediment and bed causing lubrication and a quick surge.
There are some surging glaciers in the Alaska Range in Denali: Peters, Muldrow, and Tok...

Q: Pacific Decadal Occillation is a region-wide pattern of climatic conditions that span the Northern Pacific, both with prevailing winds and ocean currents, does it affect Alaska's glaciers or do the glaciers drive the PDO?
A: PDO does have an effect on glaciers, but not vice versa

Q: How do we measure glacier flow?
A: We drill metal stakes down into the surface of a glacier, then they are frozen in place. We use GPS (2 or 3 times a year) to measure the location of the stakes as they move down-glacier. The lower part of Exit Glacier is moving about 28 cm (11 inches) each day.

Q: Other than photographs and people's memories, how do scientists track a glacier's recession? Are coordinates used? I'm sure it would be beneficial to be able to compare the amount of recession (or growth) within a specific time period.

A: We conduct glacier monitoring to do exactly that. We measure the change in glacial extent (surface area) and the change in volume (using altimetry). A current project of ours will determine the change in extent and volume for glaciers in Alaska national parks

Q: Is it common for bears to cross the harding ice field between Kenai Fjords National Park and the Kenai National Wildlife Refuge? If so is known of their success rate while crossing (do any fall in crevasses, get stuck, etc) Do some cross on a regular basis?

A: Rob has seen three different bears on the Harding icefield. One bear was spotted in a crevass but it is not known whether it escaped. One expert saw bear tracks go into crevass and then tracks from clawing itself out. Chuck saw the three bears...

Q: What pointers do you have in helping a person distinguishing between a cirque glacier and a snow field when looking across a valley?

A: If you see crevasses, it's a glacier. A snowfield won't crack. crevasses indicate movement

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Q: I'm wondering what the experts (boots on the ground) are seeing firsthand over the last few years as far as glacial melt. Who better to ask than an expert that I know has spent time in the field observing these things. Thanks
A: From Mike: Simply put, they're getting smaller and thinner. There are many examples. About 90% of Alaska's glaciers are retreating.
Response: Thanks Mike, I wish it wasn't so. Alaska has always held a fascination for me, as far back as I can remember. I fully intend to live there at least 2 years in the near future.
Response: I have a photo of Exit Glacier in the distance with a sign in the foreground saying, "Exit Glacier was here."
A: http://glacierchange.org/scrapbook/

Q: I monitor glacier change in Juneau and mass balance on the Mendenhall Glacier. Is there an Alaska-wide glacier change effort for the parks. I know glacier change is very drastic in Glacier Bay NP with some actually glaciers advancing but how do other parks compare and can you assess the state as a whole and what parks are suffering the most?
A: NPS, UAF, and APU have partnered on a 3-yr project to answer that very question. Prior monitoring has focused primarily on Glacier Bay, Denali, and Kenai Fjords. The new project will expand the monitoring to all glaciated parks in Alaska. A PDF summary of the project can be found at [this webpage]. Highlighted stories can also be found there.

Q: How does this year's deep snowpack affect glacier retreat?
A: 2011-12 will be a banner year for glaciers and the glaciers will reflect this, eventually. Remember that glacier retreat is the end result of years of ablation (melting). It's like a bank account – this year will be like having an annual budget surplus when the glaciers are in a period of long-term debt.

Q: Does glacier movement slowdown in the winter?
Flow rates for most temperate glaciers do vary seasonally. Flow typically increases during spring and summer as melt and rainwater enter the glacier and also modify the nature of the surface over which the glacier is flowing. We have been measuring flow rates at four different elevations on Exit Glacier for a couple of years now and our results are interesting because we aren't seeing that much of a difference between winter and summer flow rates. We've observed average annual flow rates of 6 to 29 centimeters (2 to 11 inches) per day. We've only noticed a decrease of about 1 to 5 centimeters (0 to 2 inches) per day in winter flow rates compared to summer flow rates.

Q: What are some wild experiences that occur while studying glaciers?
A: Not being able to see your hand in front of your face because of a storm coming in. Our rule "weather must be severe and clear!" to go outside for work. Glacier travel is a skill, our experts take a minimum of 4 people when conducting field work.

Q: How is an accurate age of a glacier sampled as they are continually moving?
A: experts say – count individual and annual layers of ice. More info @ [this webpage]

Q: What's the best/easiest way to see a glacier?
A: visit Exit #Glacier. Be safe by protecting yourself from glare. Don't stand under face of #glacier.

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Q: How many glaciers in AK?
A: About 100,000. 600 have names. Got #glacier questions for #meetaknps? Let us know.

Q: What % has melted in the last five years compared to previous 5 years?
A: Different for all 100,000 glaciers; are measured across longer time, ex. @GlacierBayNPS has 11% less than in 1952

Q: Where do glaciers get their beautiful blue color?
A: Water & ice are mostly clear but absorb red light so white light becomes more blue as it passes thru.

Q: Do glaciers ever melt away?
A: Yes, glaciers can eventually melt away if summer melt is greater than snow buildup. This can be caused by warmer temperatures, less snow fall, or a combination over a period many tens to hundreds of years.

Q: How do some glaciers get smooth?
A: The surface of glaciers looks smooth if they are covered by snow. Bare glacier ice can also look smooth (from a distance) if there are no crevasses in the surface. If you look at the lower part of a glacier and it looks smooth with gentle slopes (as opposed to bulging ice with lots of crevasses) you can guess that this glacier is probably wasting away. Look at this 360 degree view of the Kahiltna Glacier in Denali National Park.
http://www.nps.gov/dena/photosmultimedia/upload/Kahiltna-Glacier-Spring-360-Panoramic_out.swf

Q: What makes glaciers so ragged?

A: Glaciers are constantly moving. The stress of the movement causes large cracks in the glacier's surface, called crevasses. When there is no new snow cover, the effects of the glacier's motion can be seen more easily. Look at this 360 degree view of Traleika Glacier in Denali National Park and notice the ripples.
http://www.nps.gov/dena/photosmultimedia/upload/Traleika-Glacier-Fall-360-Panoramic_out.swf

Q: How cold does it have to be for a glacier to form?
A: It only has to be cold enough for snow and ice to form. Typically, glaciers form where there is a lot of snowfall and cool summers. Surprisingly, though, the air doesn't have to be below freezing all year round, and in fact, Chuck Lindsay (one of our experts) says it rarely freezing on the Harding Icefield in summer. http://www.nps.gov/dena/photosmultimedia/upload/Traleika-Glacier-Fall-360-Panoramic_out.swf

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Q: Do glaciers only form on mountains and in water?
A: There are several types of glaciers, and they form in a variety of areas, including mountains, valleys, piedmont areas, and even over continents (such as the Antarctic ice sheets).. Many of Alaska's glaciers originate from icefields high in the mountains. More on the types of glaciers can be found at the National Snow and Ice Data Center website/
http://nsidc.org/cryosphere/glaciers/questions/types.html

Q: Why do glaciers look blue?
A: Water & ice are mostly clear but absorb red light so white light becomes bluer as it passes through. More information can be found on Glacier Bay National Park's glacier information page. http://www.nps.gov/glba/naturescience/common-questions-and-myths-about-glaciers.htm

Q: How do glaciers form?
A: The formation of a glacier requires three conditions: abundant snowfall, cool summers, and the gravitational flow of ice. More information can be found on Kenai Fjord National Park's glacier information page. http://www.nps.gov/kefj/naturescience/glaciers.htm

Q: How fast do glaciers move?
A: Their speed depends on the type of glacier. The lower part of Exit Glacier, which is a mountain glacier, is moving about 28 cm (11 inches) each day. To measure the speed of movement, we drill metal stakes down into the surface of a glacier, then they are frozen in place. We use GPS (2 or 3 times a year) to measure the location of the stakes as they move down-glacier. Peters and Muldrow glaciers in Denali NP are **surging** glaciers. During its last surge, Peters glaciers moved as much as 150 feet a day!
http://www.nps.gov/dena/naturescience/surge_glacier.htm

Q: Do we need glaciers?
A: Glaciers have a major influence on aquatic and land-based ecosystems (all the plants and animals) around them. They also affect weather patterns and sea level. Scientists are studying the effect of melting glaciers and think increased melt will have profound effects on the productivity of, or amount of life in, fresh water flow systems, plant life, and coastal marine ecosystems. Learn more about the animals that depend on glaciers at Glacier Bay.
http://www.nps.gov/glba/naturescience/animals.htm

Q: How do glaciers move?
A: Gravity and the weight of the built up ice causes them to move.
http://nsidc.org/cryosphere/glaciers/questions/move.html

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Q: When glaciers form do they have holes in them?
A: No, glaciers from as a result of massive amounts of snow build up. The snow compresses into dense ice crystals. As glaciers melt in the summer they become riddled with holes. The meltwater on the surface of the glacier will form streams or rivers on the ice and sometimes these will pour into an old crevasse forming a moulin. Moulins can be huge vertical holes, and sometimes they are so deep you can't see the bottom. Moulins lead into an elaborate drainage system within the glacier ice that would remind you of swiss cheese if you could take a slice of the glacier. More at: http://nsidc.org/cryosphere/glaciers/questions/formed.html.

Q: How do glaciers form on water?
A: Typically, glaciers form in mountain areas where water falls to the ground as snow and then compresses into ice crystals. Sometimes glaciers flow into open bodies of water, such as lakes or bays. When a mountain glacier flows into the ocean, it is called a "tidewater glacier." Sometimes, tidewater glaciers are in contact with the ocean bottom because the water depth isn't deep enough to float the glacier. If the ocean water is deep enough, the terminus of a tidewater glacier can float, however this is typically an unstable condition for a tidewater glacier and extensive calving occurs along with glacier retreat.
http://ga.water.usgs.gov/edu/earthglacier.html

Q: How many glacier lakes are there in Alaska?
A: 538 glacier-dammed lakes, for ex. Hidden Creek Lake dammed by Kennecott Glacier @WrangellStENPS

Q: Want a career in #glaciers?
A: Study geology, enjoy outdoors, take a hike, spend time on glacier. Learn more http://bit.ly/xNCTwd

Q: How is an accurate age of a glacier sampled as they are continually moving?
A: experts say - count individual & annual layers of ice. More info @ http://on.fb.me/y8rNTJ #glaciers #meetAKNP #DOIsci: Vast majority of glaciers are retreating/thinning. U can see them in @Alaskanps. ~MW

Twitter posts:
#glaciers #meetAKNPS science is a critical component in understanding history, importance, current status, & future outlook of #glaciers

@AlaskaNPS #DOIsci & scientists work together to understand #glaciers, advise managers & public about their importance & future

#Glaciers #meetAKNPS Effects of climate change can be seen on AK #glaciers. Science tells the story http://1.usa.gov/vZsjrM ~MW

Final thoughts from #Glaciers #meetAKNPS: #glaciers are precious and we're going to miss them when they are gone. ~MW

Live data from the @KenaiFjordsNPS Harding Icefield #MeetAKNPS #glaciers http://bit.ly/ynCLDv